**1** The diagram below shows six pieces of equipment.
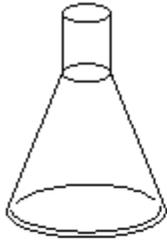

A
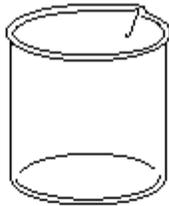
B

C
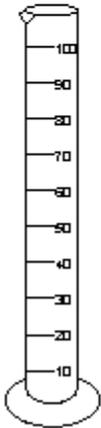
D
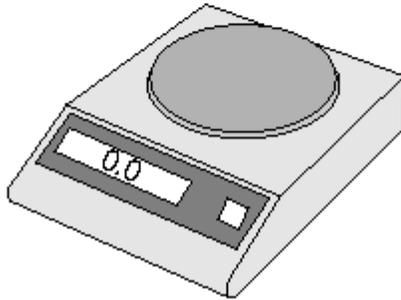
E
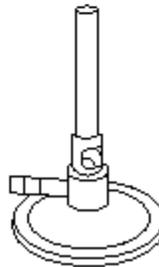
F

(a) Linda investigates how quickly sugar dissolves in water.

    (i) Which piece of equipment does she use to weigh 5 g of sugar?
    Tick the correct box.

A   B   C   D   E   F

☐   ☐   ☐   ☐   ☐   ☐

1 mark

    (ii) Which piece of equipment does she use to measure out 90 cm^3 of water?
    Tick the correct box.

A   B   C   D   E   F

☐   ☐   ☐   ☐   ☐   ☐

1 mark

(b)   Linda heats the water in a beaker.

   (i)   Which piece of equipment shown is a beaker?
          Tick the correct box.

   A   **B**   **C**   **D**   **E**   **F**

   [ ]   [ ]   [ ]   [ ]   [ ]   [ ]

                                                                    1 mark

   (ii)   Which piece of equipment shown is used to heat water?
          Tick the correct box.

   A   **B**   **C**   **D**   **E**   **F**

   [ ]   [ ]   [ ]   [ ]   [ ]   [ ]

                                                                    1 mark

(c)   Linda adds 5 g of sugar to the hot water.

   (i)   She measures the time it takes for the sugar to dissolve.
          The equipment used for timing is **not** shown in the diagram.

          What piece of equipment is used to measure the time taken?

          ....
                                                                    1 mark

   (ii)   The equipment used to measure the temperature of the water is **not** shown in the
          diagram.

          What piece of equipment is used to measure temperature?

          ....
                                                                    1 mark
                                                            maximum 6 marks

2 (a) Peter used the equipment below to investigate growth of plants.

equipment	measurement	unit
	measures the **time** for the experiment	cm
	measures the **temperature** of the air	ºC
	measures the **length** of a plant	days
	measures the **mass** of a plant	grams
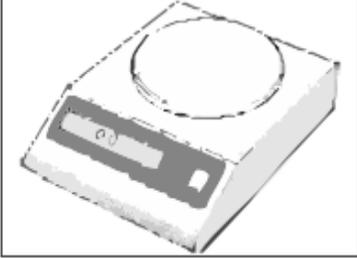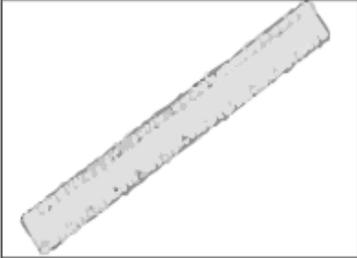
(i) Draw one line from each piece of **equipment** to the **measurement** Peter made.

2 marks

(ii) Then draw one line from each **measurement** to the correct **unit**.

2 marks

(b)   The diagrams below show four measuring containers.

cm³
50
40
30
20
10

cm³
100

50

cm³
50
40
30
20
10

cm³
75

50

25

A   B   C   D
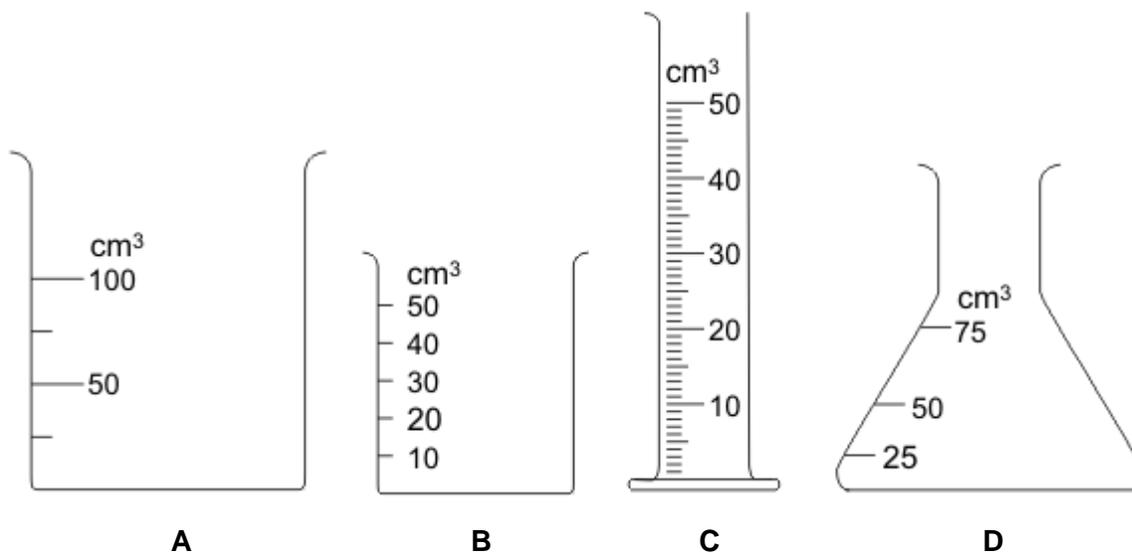
Which is the best container to use to measure 15 cm³ of water?

Write the letter.

....

Why did you choose this container?

....

....

1 mark

maximum 6 marks

3   Jack and Aneesa dropped a steel ball into trays of damp sand.
They measured the depth of the craters made by the steel ball.

steel ball —

damp sand

crater

not to scale
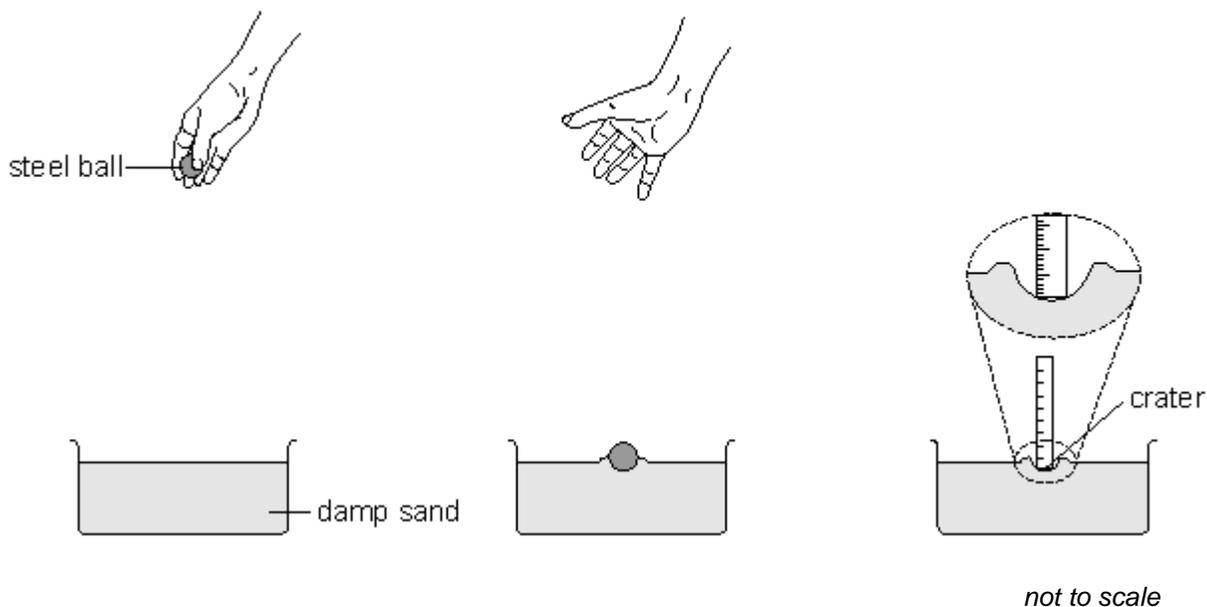
Their results are shown in the table below.

height the ball was dropped from (cm)	depth of crater (cm)		
	Jack's results		Aneesa's results
10	1.1	1.2	0.8
20	1.4	1.5	1.4
30	1.6	1.6	1.5
40	1.8	1.7	1.8
50	2.0	2.1	2.1

(a) Use information in the table to answer the questions below.

(i) What was the independent variable that Jack and Aneesa changed in their investigation?

....

1 mark

(ii) Why was Jack's investigation better than Aneesa's?

....

1 mark

(b) Look at the results in the table.
What is the relationship between the height the ball was dropped from and the depth of the crater?

....

....

1 mark

(c) Aneesa said that they made sure the investigation was fair.

Suggest **two** variables they must have kept the same to make their investigation fair.

1 ....

2 ....

2 marks

(d) (i)   Jack removed the steel ball using his fingers. Then he measured the depth of the crater.
Aneesa said he should use a magnet instead of his fingers.

Explain why using a magnet to remove the ball would improve the investigation.

....

....

1 mark

(ii) Jack said that the ball could be dropped using an electromagnet instead of dropping it by hand.
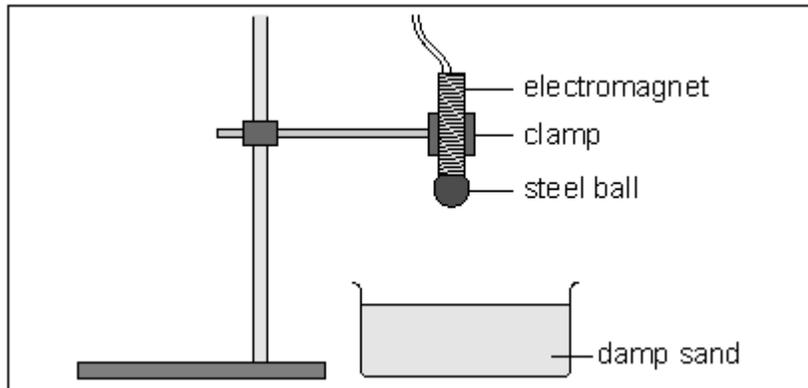
Explain why this would improve the investigation.

....

....

1 mark
maximum 7 marks

4 Jason wanted to find out if hair dye makes hair weaker.
He used 5 hairs of equal length.
He soaked each hair in a different concentration of hair dye for 15 minutes.
He added masses to each hair until it broke.
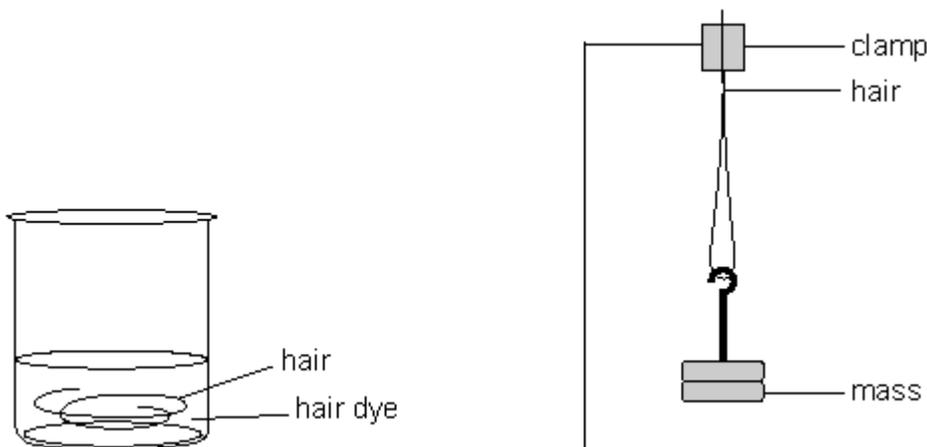
not to scale

(a)   The table below shows Jason's results.

   (i)   Plot a graph of Jason's results **and** draw a line of best fit.

concentration of hair dye (%)	mass needed to break the hair (g)
0.4	71
0.8	67
1.2	64
1.6	61
2.0	58
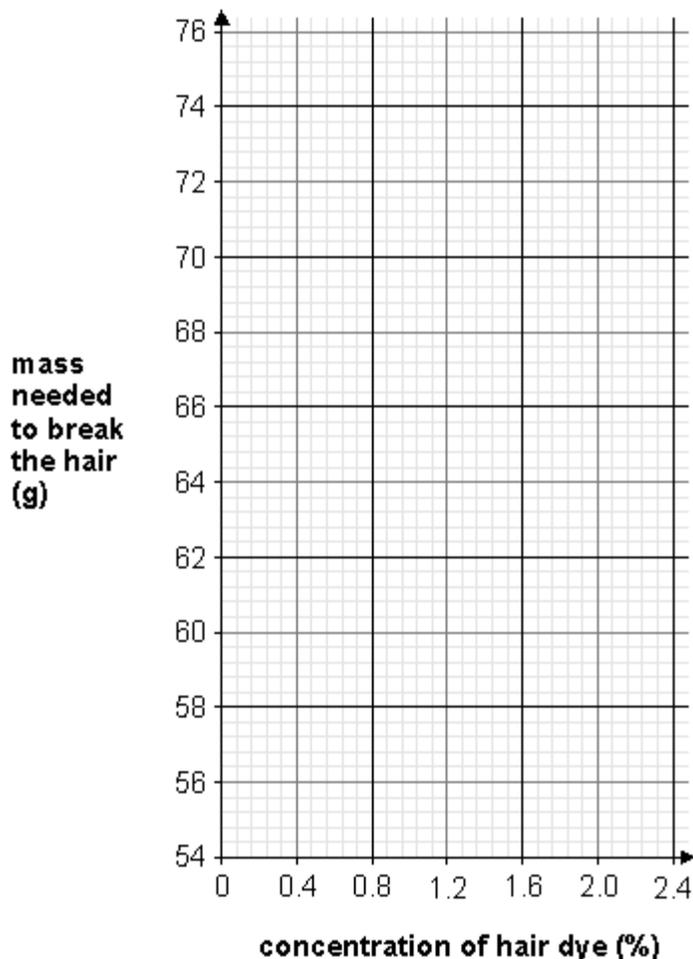
3 marks

   (ii)   Use the graph to work out the mass needed to break hair soaked in water (0% hair dye).

   .... g

1 mark

(b)   What was the independent variable that Jason **changed** in this experiment?

....

1 mark

(c)   What was the dependent variable that Jason **measured** in this experiment?

....

1 mark

(d)   What is the relationship between the concentration of hair dye and the mass needed to break the hair?

....

....

1 mark

(e)   Jason wanted to investigate whether soaking hair in dye for different amounts of time affected the strength of the hair.
   Jason drew a table for his results.
       Add headings **and** units to the table below for Jason's investigation.

heading 1 .... (..........)	**heading 2** .... (..........)

4 marks

maximum 11 marks

---

5   Jay collected pond snails from the school pond.
       He measured the lengths of all their shells.
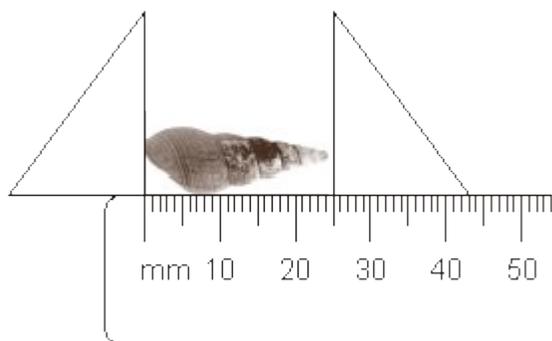
(a)   What is the length of the shell above?

       .... mm

1 mark

(b)   Jay made a tally chart of the lengths of all the shells he found.

range of lengths of shells (mm)	0-5	6-10	11-15	16-20	21-25	26-30
number of shells	I	I	I	III	IIII	I

What was the most common **range** of lengths of shells Jay collected?

.... mm

1 mark

(c)   Jay recorded his results in a bar chart.
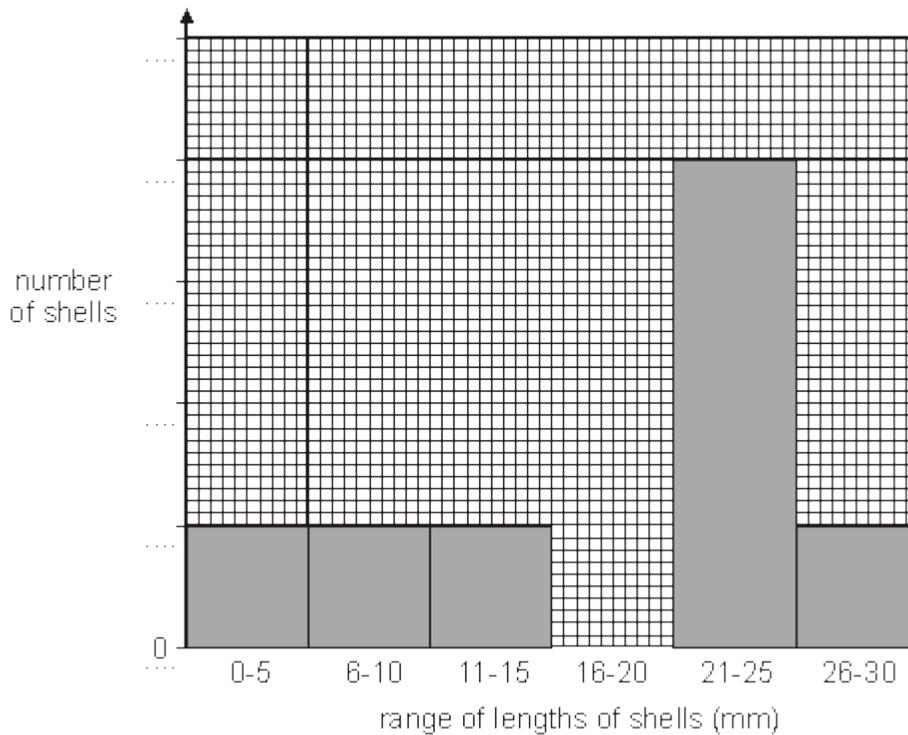
(i)   Add the missing numbers to the side of the bar chart labelled 'number of shells'.

1 mark

(ii)   **On the chart above,** draw the bar for the number of shells measuring 16-20 mm.

1 mark

(d)   Look at Jay's results and decide if each conclusion below is **true** or **false** or if you
cannot tell.
Tick the correct box for each conclusion.

conclusions	true	false	cannot tell
The oldest snails have the darkest shells.	☐	☐	☐
He did **not** find any shells longer than 30 mm.	☐	☐	☐
He found a total of eight snails.	☐	☐	☐
All the snails he found are the same type.	☐	☐	☐

2 marks

maximum 6 marks

6   Tea bags are made in different shapes.
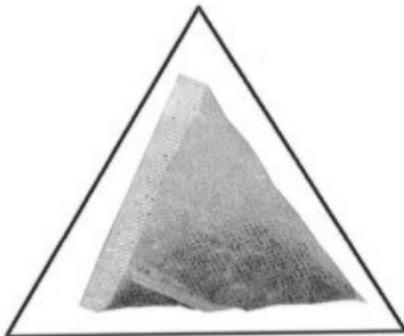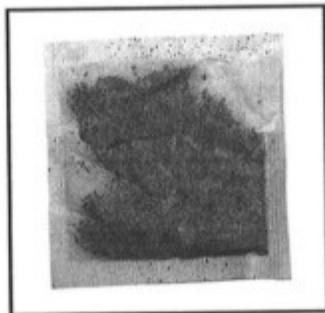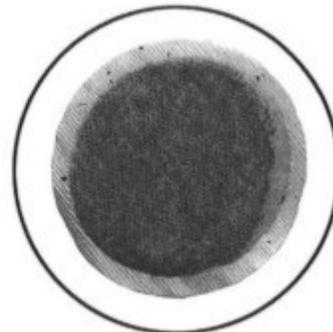
triangle   **square**   **circle**

Some pupils want to find out which shape of tea bag lets tea dissolve most quickly.
They make two plans for their investigation as shown below.

FIRST PLAN
We will use 3 tea bags and 3 beakers

SECOND PLAN
Collect three beakers.
Collect three different tea bags.
Put one tea bag in each beaker.
Add 150 cm^3 of water at 65°C.
Keep the temperature of the water the same.
Measure the time taken for the tea to dissolve.
Find out which is the quickest for making tea.

(a)   How is the second plan better than the first plan?

....

....

1 mark

(b)   Why should they take care when they add hot water at 65°C to the tea bags?

....

....

1 mark

(c)   Ben and Vicky drew a cross on some paper. They put each beaker, in turn, over the cross.
They poured hot water into the beaker, dropped in the tea bag and watched the water
change colour.
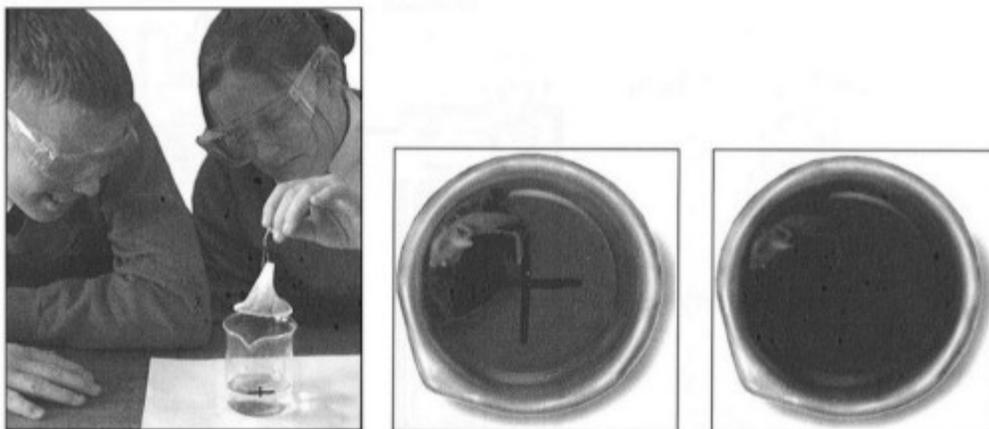
To see which shape of tea bag let the tea dissolve the quickest, they measured the time
until the liquid was too dark for them to see the cross.

How did the cross help to make their test more accurate?

....

1 mark

(d)   (i)   They recorded their measurements in a table as shown below.

shape of tea bag	time taken until cross cannot be seen (minutes)
triangle	8
square	15
circle	10

Which part of their investigation was recorded in the table?
Tick the correct box.

explanations ☐   results ☐

conclusions ☐   plans ☐

1 mark

(ii)   Give the **three** shapes of tea bags in the order in which the tea dissolved.
Use the table above to help you.

quickest _____ _____ _____ slowest

1 mark
maximum 5 marks

7 Paula made a pendulum from a ball attached to a piece of string.
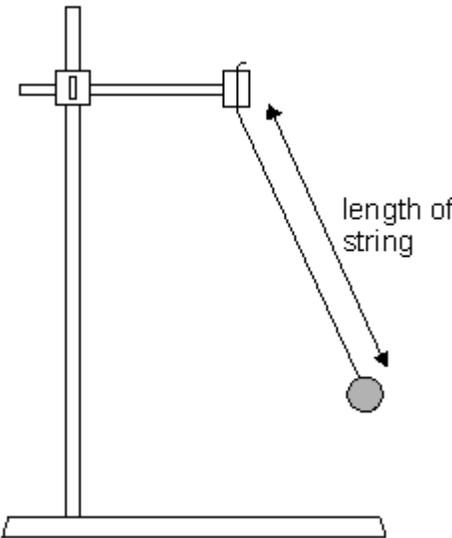
length of
string

She counted the number of swings the ball made in 10 seconds.
She repeated the experiment with different lengths of string.

The table below shows Paula's results.

| length of string (cm)	number of swings in 10 seconds
10	16
20	11
30	9
40	8
50	7

(a)   What happens to the number of swings when the string gets longer?

....

1 mark

(b)   Paula drew a graph of her results.

(i)   Write the labels on **both axes** of the graph below.
Use the table to help you.

_____

_____

_____
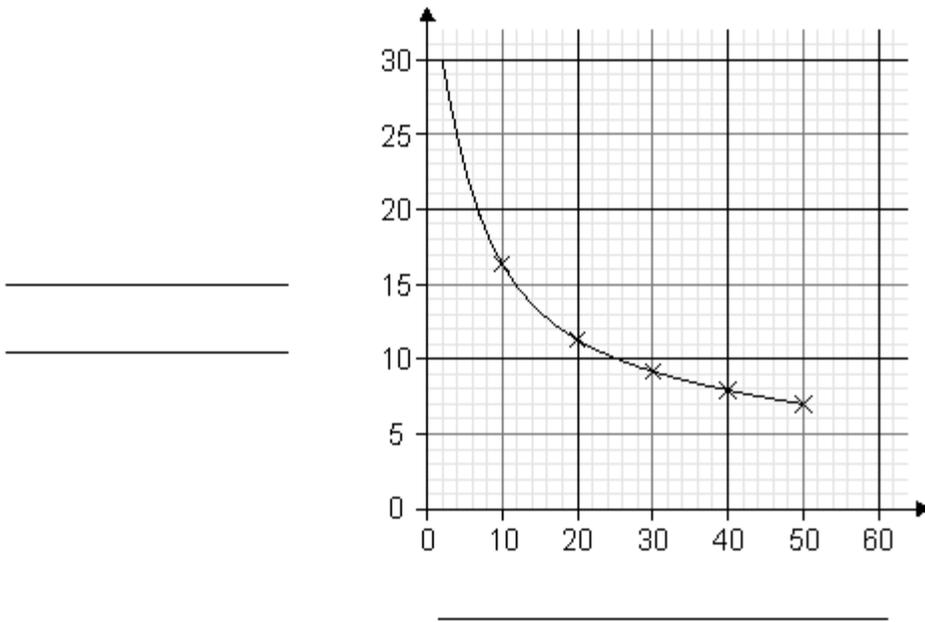
2 marks

(ii)   Paula made a pendulum from a piece of string that was 15 cm long.
How many times would this pendulum swing in 10 seconds?
Use the graph to help you.

....

1 mark

(iii)   Paula made a pendulum from a piece of string that was 60 cm long.
Estimate the number of swings the pendulum makes in 10 seconds.
Use the graph.
Tick the best answer.

18 ☐   12 ☐   6 ☐   4 ☐

1 mark

(c)   After some time the pendulum stops moving.
What force makes the pendulum stop moving?

....

1 mark

maximum 6 marks

8 Kiran lit a candle.
She placed a 100 cm³ glass jar over the candle.
The candle flame went out after 2 seconds.
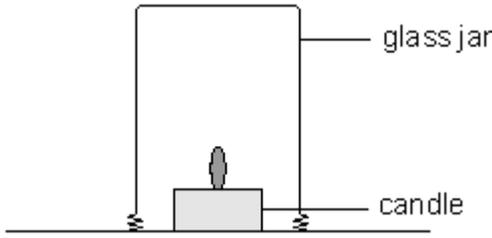
(a) Why did the flame go out?

....

....

1 mark

(b) Kiran put different sized jars over a lit candle.
She measured the time it took for the flame to go out each time.
She recorded her results in a table.

size of jar (cm³)	time for candle to go out (s)
100	2
250	5
500	9
1000	22
2000	37
3000	60

(i) **Plot Kiran's results** on the graph paper below.
The first one has been done for you.

1 mark

(ii)   Draw a line of best fit.

time for
candle
to go
out (s)

[Graph with y-axis "time for candle to go out (s)" ranging from 0 to 60, x-axis "size of jar (cm³)" ranging from 0 to 3000, with a single data point marked × near (100, 2)]

size of jar (cm³)
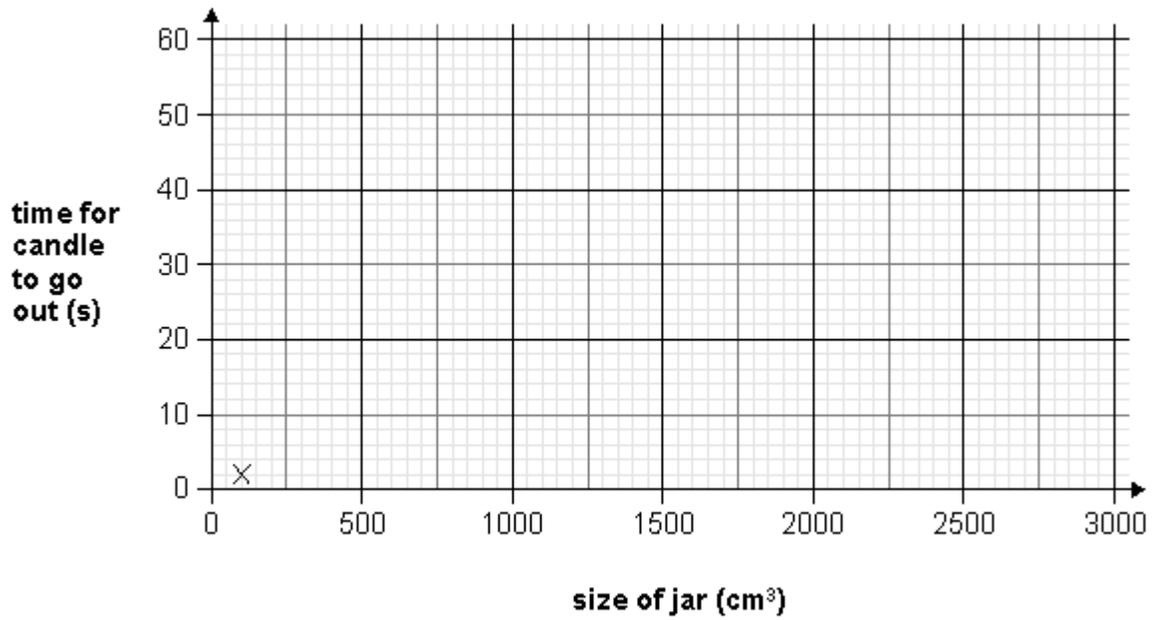
1 mark

(iii)   What conclusion can you make from her results?

....

....

1 mark

(c)   What should Kiran keep the same in this experiment to make it a fair test?

....

1 mark

(d)   Suggest **one** way for Kiran to make her results more reliable.

....

1 mark
maximum 6 marks